

**Remarks**

Applicant has carefully reviewed this Application in light of the Final Office Action electronically sent 4 January 2007. Applicant respectfully requests reconsideration and allowance of all pending claims.

**The Claims Recite Patentable Subject Matter  
Under 35 U.S.C. § 101**

The Examiner rejects Claims 1-2, 5, 7, 9-12, 15, 17, 19-22, 25, 27, and 29-31 under 35 U.S.C. § 101 because “the claimed invention is directed to non-statutory subject matter.” According to the Examiner, “The system does not produce or output any result that is concrete, tangible and useful. Nothing tangibly embodies in the real world. The result is an abstract idea which must be further manipulated or interpreted to be useful.”

Applicant respectfully disagrees with the Examiner. The ***PMF score of the protein-ligand complex*** resulting from the calculations recited in independent Claims 1, 11, 21, and 31 indicates ***a binding affinity between a protein and a ligand in the protein-ligand complex***, as recited in independent Claims 1, 11, 21, and 31.

As Applicant pointed out in the Response filed 6 September 2006, “the transformation of electrocardiograph signals from a patient’s heartbeat by a machine through a series of mathematical calculations constituted a practical application of an abstract idea (a mathematical algorithm, formula, or calculation), because it corresponded to a useful, concrete or tangible thing—the condition of a patient’s heart.” *State Street Bank & Trust Co. v. Signature Financial*, 149 F.3d 1368, 1373, 47 U.S.P.Q.2d 1596, 1601 (Fed. Cir. 1998) (discussing *Arrhythmia Research Technology Inc. v. Corazonix Corp.*, 958 F.2d 1053, 22 U.S.P.Q.2d 1033 (Fed. Cir. 1992)). Accordingly, the Federal Circuit held that claims directed to the same recited statutory subject matter under 35 U.S.C. § 101. See *Arrhythmia Research*, 958 F.2d at 1059-61, 22 U.S.P.Q.2d at 1038-1039.

In *Arrhythmia Research*, the Federal Circuit found that the following claims both recited statutory subject matter under 35 U.S.C. § 101:

1. A method for analyzing electrocardiograph signals to determine the presence or absence of a predetermined level of high frequency energy in the late QRS signal, comprising the steps of:

converting a series of QRS signals to time segments, each segment having a digital value equivalent to the analog value of said signals at said time;

applying a portion of said time segments in reverse time order to high pass filter means;

determining an arithmetic value of the amplitude of the output of said filter; and

comparing said value with said predetermined level.

7. Apparatus for analyzing electrocardiograph signals to determine the level of high frequency energy in the late QRS signal comprising:

means for converting X, Y, and Z lead electrocardiographic input signals to digital valued time segments;

means for examining said X, Y, and Z digital valued time segments and selecting therefrom the QRS waveform portions thereof;

means for signal averaging a multiplicity of said selected QRS waveforms for each of said X, Y, and Z inputs and providing composite, digital X, Y, and Z QRS waveforms;

high pass filter means;

means for applying to said filter means, in reverse time order, the anterior portion of each said digital X, Y, and Z waveform; and

means for comparing the output of said filter means with a predetermined level to obtain an indication of the presence of a high frequency, low level, energy component in the filter output of said anterior portions.

958 F.2d 1053, 1055, 1059-61, 22 U.S.P.Q.2d 1033, 1035, 1038-39 (Fed. Cir. 1992).

Regarding the method claim, the Federal Circuit stated:

These claimed steps of “converting,” “applying,” “determining,” and “comparing” are physical process steps that transform one physical, electrical signal into another. The view that there is nothing necessarily physical about signals is incorrect. The *Freeman-Walter-Abele* standard is met, for the steps of Simson’s claimed method comprise an otherwise statutory process whose mathematical procedures are applied to physical process steps.

*Arrhythmia Research*, 958 F.2d at 1059, 22 U.S.P.Q.2d at 1038 (citations omitted).

Regarding the apparatus claim, the Federal Circuit stated:

The Simson apparatus claims thus define a combination of interrelated means for performing specified functions. The computer-performed operations transform a particular input signal to a different output signal, in accordance with the internal structure of the computer as configured by electronic instructions. The claimed invention converts one physical thing into another physical thing just as any other electrical circuitry would do.

....

Corazonix argues that the final output of the claimed apparatus (and process) is simply a number, and that *Benson* and *Flook* support the position that when the end product is a number, the claim is nonstatutory and can not be saved by claim limitations of the use to which this number is put. However, the number obtained is not a mathematical abstraction; it is a measure in microvolts of a specified heart activity, an indicator of the risk of ventricular tachycardia. That the product is numerical is not a criterion of whether the claim is directed to statutory subject matter.

The Simson apparatus claims satisfy the criteria for statutory subject matter. They are directed to a specific apparatus of practical utility and specified application, and meet the requirements of 35 U.S.C. § 101.

*Arrhythmia Research*, 958 F.2d at 1060-61, 22 U.S.P.Q.2d at 1039 (citations omitted).

Applicant respectfully submits that the *PMF score of the protein-ligand complex* resulting from the calculations recited in independent Claims 1, 11, 21, and 31 of this Application, which indicates *a binding affinity between a protein and a ligand in the protein-ligand complex*, as recited in independent Claims 1, 11, 21, and 31, is no less concrete, practical, tangible, or useful than electrocardiograph signals from a patient's heartbeat transformed by a machine through a series of mathematical calculations, which the Federal Circuit has expressly held to constitute statutory subject matter under 35 U.S.C. § 101 in *Arrhythmia Research* and later in *State Street*.

Accordingly, Applicant respectfully requests reconsideration and allowance of independent Claims 1, 11, 21, and 31 and all their dependent claims.

#### **Independent Claim 31 is Definite Under 35 U.S.C. § 112**

The Examiner rejects independent Claim 31 as "being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention." According to the Examiner, "In claim 31, it is entirely unclear what the system

comprises. No hardware of any sort is set forth in the claim and the specification does not set forth any particular definition for a system. Claim 31 merely requires a module capable of performing a particular calculation. There are no means for inputting or outputting any information. There is no hardware, memory, processor, etc. associated with the system.” Applicant respectfully disagrees with the Examiner.

Independent Claim 31 of this Application recites:

A system comprising:  
means for determining an atom-pair type of a protein-ligand atom pair in a protein-ligand complex;  
means for calculating a repulsion term of the protein-ligand atom pair according to a minimum binding-energy distance value and a well-depth value of the atom-pair type;  
means for calculating a potential of mean force (PMF) of the protein-ligand atom pair according to the calculated repulsion term of the protein-ligand atom pair; and  
means for calculating a PMF score of the protein-ligand complex according to the calculated PMF of the protein-ligand atom pair, the PMF score indicating a binding affinity between a protein and a ligand in the protein-ligand complex.

Applicant respectfully submits that Claim 31 does not recite any modules.

Moreover, the Specification provides the following description:

FIGURE 1 illustrates an example system 10 for calculating a PMF score of a protein-ligand complex. System 10 includes a computer system 12 and a PMF-scoring module 14. In particular embodiments, a module may include software, hardware, or both. Computer system 12 may enable a user to provide input to and receive output from PMF-scoring module 14. Computer system 12 may include one or more modules for generating one or more graphical user interfaces (GUIs) for providing input to and receiving output from PMF-scoring module 14. PMF-scoring module 14 may calculate one or more PMF scores of one or more protein-ligand complexes specified by a user and return the calculated PMF scores to the user. A PMF score of a protein-ligand complex may indicate the binding affinity between the protein and the ligand in the protein-ligand complex, and the binding affinity between the protein and the ligand in the protein-ligand complex may indicate the ability of the ligand to inhibit or otherwise modify the function of the protein. PMF-scoring module 14 includes a repulsion-term module 16 that may calculate one or more repulsion terms, as described below. PMF-scoring module 14 may use PMF-scoring data 18 to calculate a PMF score of a

protein-ligand complex. PMF-scoring data 18 data that PMF-scoring module 14 may use to calculate a PMF score of a protein-ligand complex. In particular embodiments, PMF-scoring data 18 includes empirically derived parameters (such as minimum binding-energy distance and well-depth values) that may be used to calculate a PMF score of a protein-ligand complex, as described below. Although components of system 10 are described and illustrated as being separate from each other, the present invention also contemplates any suitable components of system 10 being combined with any other suitable components in any suitable manner. As an example and not by way of limitation, in particular embodiments, PMF-scoring module 14 is executed at computer system 12. As another example, in particular embodiments, PMF-scoring data 18 is stored at computer system 12.

(Specification, Page 5, Lines 2-28). The Specification provides further descriptions of system 10, computer system 12, PMF-scoring module 14, repulsion-term module 16, and PMF-scoring data 18 and their collective and individual functionality. In particular embodiments, system 10, computer system 12, PMF-scoring module 14, repulsion-term module 16, PMF-scoring data 18, or a combination of two or more such structures perform functions recited in Claim 31.

Furthermore, Applicant respectfully submits that, contrary to the Examiner's assertions, independent Claim 31 need not recite "means for inputting or outputting any information" or "hardware, memory, processor, etc. associated with the system" to be definite under 35 U.S.C. § 112 paras. 2 and 6.

Accordingly, Applicant respectfully requests reconsideration and allowance of independent Claim 31.

#### **Applicant has Amended Dependent Claims 2, 5, 7, and 9-10**

The Examiner objects to dependent Claims 2, 5, 7, and 9-10 because of informalities. Applicant has amended dependent Claims 2, 5, 7, and 9-10. Accordingly, Applicant respectfully requests reconsideration and allowance of dependent Claims 2, 5, 7, and 9-10.

**Conclusion**

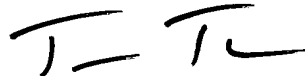
For at least the foregoing reasons, Applicant respectfully requests allowance of all pending claims.

If a telephone conference would advance prosecution of this Application, Applicant invites the Examiner to call Travis W. Thomas, attorney for Applicant, at 214.953.6676.

The Commissioner is authorized to charge any fee and credit any overpayment to Deposit Account No. 02-0384 of Baker Botts L.L.P.

Respectfully submitted,

BAKER BOTTS L.L.P.  
Attorneys for Applicant

A handwritten signature in black ink, appearing to be 'T. Thomas'.

Travis W. Thomas  
Reg. No. 48,667

**Date:** 19 March 2007

**Correspondence Address:**

Customer Number: **05073**